In the claims

Claims 1-17 (canceled)

18. (Original) A magnetic read head which has an air bearing surface (ABS), comprising:

a tunnel junction sensor including:

a ferromagnetic pinned layer structure that has a magnetic moment;

an antiferromagnetic pinning layer exchange coupled to the pinned layer structure for pinning the magnetic moment of the pinned layer structure;

a ferromagnetic free layer structure which has a magnetic moment;

a nonmagnetic electrically insulative barrier layer located between the free layer structure and the pinned layer structure; and

the pinned layer structure or the free layer structure having an oxidized monolayer that is adjacent the barrier layer.

19. (Original) A magnetic read head as claimed in claim 18 wherein the pinned layer structure includes a cobalt based layer that has said oxidized monolayer.

20. (Original) A magnetic read head as claimed in claim 19 wherein the cobalt based layer is cobalt iron (CoFe).

21. (Original) A magnetic read head as claimed in claim 20 including:

ferromagnetic first and second shield layers; and

the tunnel junction sensor being located between the first and second shield layers.

22. (Original) A magnetic head assembly having an air bearing surface (ABS), comprising:

a write head including:

ferromagnetic first and second pole piece layers that have a yoke portion located between a pole tip portion and a back gap portion;

a nonmagnetic write gap layer located between the pole tip portions of the first and second pole piece layers;

an insulation stack with at least one coil layer embedded therein located between the yoke portions of the first and second pole piece layers; and

the first and second pole piece layers being connected at their back gap portions; and

a read head including:

a first shield layer;

a tunnel junction sensor located between the first shield layer and the first pole piece layer;

the tunnel junction sensor including:

a ferromagnetic pinned layer structure that has a magnetic moment;

an antiferromagnetic pinning layer structure exchange coupled to the pinned layer structure for pinning the magnetic moment of the pinned layer structure;

a ferromagnetic free layer structure which has a magnetic moment; and

a nonmagnetic electrically insulative barrier layer located between the free layer structure and the pinned layer structure; and

the pinned layer structure or the free layer structure having an oxidized monolayer that is adjacent the barrier layer.

23. (Original) A magnetic head assembly as claimed in claim 22 wherein the pinned layer structure includes a cobalt based layer that has said oxidized monolayer.

24. (Original) A magnetic head assembly as claimed in claim 23 wherein the cobalt based layer is cobalt iron (CoFe).

25. (Original) A magnetic head assembly as claimed in claim 24 including:

ferromagnetic first and second shield layers; and

the tunnel junction sensor being located between the first and second shield layers.

26. (Original) A magnetic disk drive including at least one magnetic head assembly that has an a write head, a read head and an air bearing surface (ABS) comprising:

the write head including:

ferromagnetic first and second pole piece layers that have a yoke portion located between a pole tip portion and a back gap portion;

a nonmagnetic write gap layer located between the pole tip portions of the first and second pole piece layers;

an insulation stack with at least one coil layer embedded therein located between the yoke portions of the first and second pole piece layers; and

the first and second pole piece layers being connected at their back gap portions; and

the read head including:

a first shield layer;

a tunnel junction sensor located between the first shield layer and the first pole piece layer;

the tunnel junction sensor including:

a ferromagnetic pinned layer structure that has a magnetic moment;

an antiferromagnetic pinning layer exchange coupled to the pinned layer structure for pinning the magnetic moment of the pinned layer structure;

a ferromagnetic free layer structure which has a magnetic moment;

a nonmagnetic electrically insulative barrier layer located between the free layer structure and the pinned layer structure; and

the pinned layer structure or the free layer structure having an oxidized monolayer that interfaces the barrier layer;

a housing;

a magnetic disk rotatably supported in the housing;

a support mounted in the housing for supporting the magnetic head assembly with said ABS facing the magnetic disk so that the magnetic head assembly is in a transducing relationship with the magnetic disk;

a spindle motor for rotating the magnetic disk;

an actuator positioning means connected to the support for moving the magnetic head assembly to multiple positions with respect to said magnetic disk; and

a processor connected to the magnetic head assembly, to the spindle motor and to the actuator for exchanging signals with the magnetic head assembly, for controlling movement of the magnetic disk and for controlling the position of the magnetic head assembly.

27. (Original) A magnetic disk drive as claimed in claim 26 wherein the pinned layer structure includes a cobalt based layer that has said oxidized monolayer.

28. (Original) A magnetic disk drive as claimed in claim 27 wherein the cobalt based layer is cobalt iron (CoFe).

29. (Original) A magnetic disk drive as claimed in claim 27 including:

ferromagnetic first and second shield layers; and

the tunnel junction sensor being located between the first and second shield layers.